Public Service Commission of Wisconsin
Office of Energy Innovation
Critical Infrastructure Microgrid and
Community Resilience Center Pilot Grant
Program

ATTACHMENT A - COVER SHEET

SECTION I - Provide information summarizing the project proposal.				
Project Title:	Holy Wisdom Monastery Emergency Shelter			
PSC Grant Request ($):	**Applicant Cost Share ($):**	**Project Total ($):**		
$50,000	$24,500	$74,500		
Choose one Eligible Activity				
□ Critical Infrastructure Microgrid Feasibility Study Level 1 and 2	□ Critical Infrastructure Microgrid Feasibility Study Level 3	X Community Resilience Center Feasibility Study		
SECTION II - Provide information for your organization, signatory, and primary contact for the project.				
Applicant Type:	□ City	□ Village	□ Town	□ County
□ Tribal Nation	□ Wisconsin Technical College System			
□ University of Wisconsin System □	□ K-12 School District	X 501(c)(3) nonprofit		
□ Municipal Utility (water, wastewater, electric, natural gas)		□ Hospital (public or nonprofit)		
Name (on W-9)**:**	Smart Electric Power Alliance (SEPA)			
Address (on W-9)**:**	1800 M Street, NW, Front 1 #33159, Washington, DC 20036			
County or Counties Served by Project:	Town of Westport			
DUNS Number or CAGE Code:	03-196-3361-000			
NAICS Code:	221114			
Authorized Representative/Signatory (Person authorized to submit applications and sign contracts)		**Primary Contact** (if different from Authorized Representative)		
Name:	Sharon Allan	**Name:** Jared Leader		
Title:	Chief Strategy and Innovation Officer	**Title:** Senior Manager, Industry Strategy		
Phone:	919-414-2173	**Phone:** 703-678-5618		
E-mail:	sallan@sepapower.org	**E-mail:** jleader@sepapower.org		
Signature of the Authorized Representative	Sharon S. Allan			

SEPA
Holy Wisdom Monastery Emergency Shelter

Summary of Project Budget				
Line	**Description**	**PSC Grant Request**	**Applicant Cost Share**	**Total Project Cost**
1	Personnel	$45,000	$24,500	$69,500
2	Fringe			$0
5	Travel			$0
6	Contractual	$5,000		$5,000
7	Other			$0
8	Indirect			$0
	Totals	$50,000	$24,500	$74,500
	% of Total	**67%**	**33%**	

Applicant Comments:

SEPA (applicant): Cost Share = $12,000 (industry outreach), Grant Request = $50,000

MGE: Cost Share = $7,500 (75 hours of in-kind labor at an estimated $100/hr blended rate)

Holy Wisdom: Cost Share = $5,000 (50 hours of in-kind labor at an estimated $100/hr blended rate) and $5,000 carve out for the grant request via sub-contract.

1.0 Project Description

The Holy Wisdom Monastery site consists of the Holy Wisdom Monastery and Retreat and serves members of its community in the Town of Westport. The site facilities are located off 4200 County Highway in Middleton, Wisconsin. The Holy Wisdom customer is served by Madison Gas and Electric (MGE), the local electrical distribution utility.

There are a number of factors that play into the investigation of a microgrid for this facility:

- In 2000, Holy Wisdom enrolled in MGE' back-up generation service due to its resiliency needs as a known municipal emergency shelter and business needs. This service is provided by an MGE owned and operated backup diesel generator. Holy Wisdom has aggressive renewable energy targets and although they aren't the owner/operator of the on-site diesel generator, they are concerned with the optics that having an on-site diesel generator come with. They are interested in alternative solutions for providing back-up service for their facility and have approached MGE inquiring if an alternative existed.
- The facility has an existing 125 kilowatt (kW) solar facility installed, effectively decreasing the site requirements and cost for any alternative back-up solutions that are investigated as part of a microgrid study.
- The current diesel generator that is on-site is significantly oversized for the application and there is concern that the unit would be so lightly loaded that there may be issues providing reliable back-up service to the site.
- MGE is currently looking for a storage pilot project that would provide both customer and utility benefits and this was one of the potential locations that is actively being investigated.
- The Town of Westport and Holy Wisdom have an existing agreement that commits critical services and to establishes the facility as an emergency shelter for the Town of Westport.
- Holy Wisdom has an agreement with the Dane County Airport to provide critical services for stranded airline travelers during an emergency. Serving as this emergency shelter for the Town of Westport and Dane County Airport, the Monastery, Retreat, and Guest House need to be capable of supporting operation for extended periods of grid outages. As the customer decarbonizes, the best way to achieve that goal is to shift to add additional solar PV with winter operation capability and battery energy storage system (BESS).
- Holy Wisdom is planning a solar system expansion increasing their solar system by an additional 266 kW. This could include a storage solution.

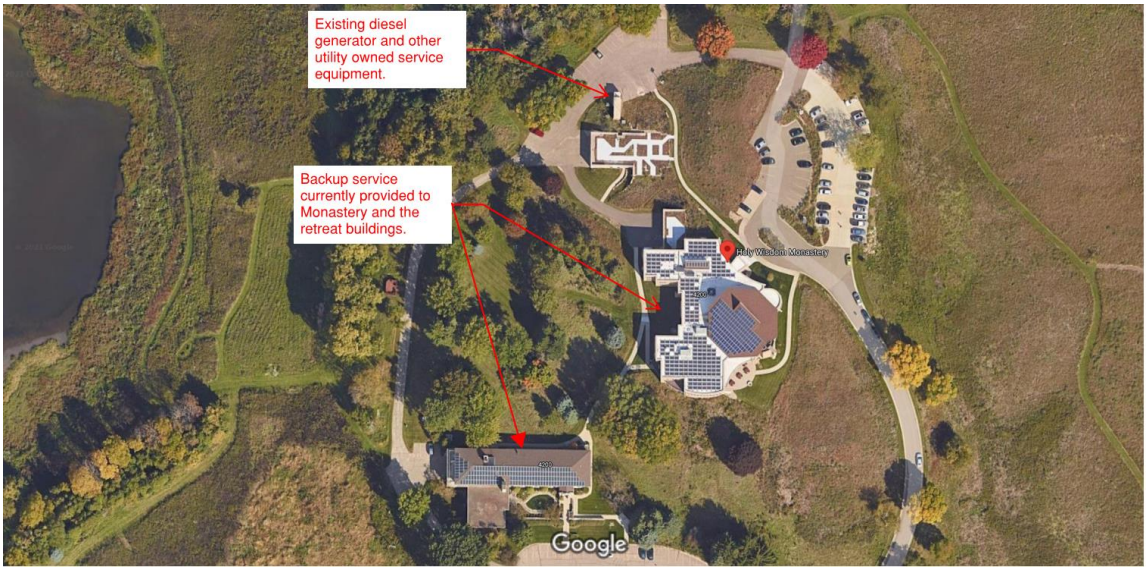
2.0 Merit Review Criteria

Identification of Critical Infrastructure

The site consists of a Monastery and retreat. The site facilities also include offices and meeting rooms, as well as several living quarters. In the event of a grid outage, the Monastery, Retreat,

and Guest House need to be capable of supporting operation as an emergency shelter. Figure 2.0 below shows the layout of the site designating the location of the existing diesel generator and other utility owned equipment. Currently there are back-up services being provided to the Monastery and the retreat buildings. The site can also serve as an emergency shelter for the Town of Westport, which has a population of 3586.

Figure 2.0 - ***Site Aerial Image***



Source: MGE, 2021

Key Partners and Stakeholders

The Smart Electric Power Alliance (SEPA) plans on working directly with Holy Wisdom and MGE to lead the development of the microgrid feasibility study. Key partners to the project team will also include Holy Wisdom Board of Directors and Sustainability Team (Hoffman Planning Design, and Construction Inc.), Town of Westport, Bendictine Women, and Dane Buy Local, as listed in Table 2.1. Other key stakeholders, listed in Table 2.2, will be engaged regularly throughout the development of the study.

Table 2.1 - ***Core Project Team and Responsibilities***

Project Partners	**Responsibility**	**Role**
SEPA	Lead on community engagement and microgrid feasibility study development	Applicant and non-profit organization focused on advancing clean energy and resiliency goals

MGE	Technical and strategic support	Local electric distribution utility
Holy Wisdom	Technical, strategic, and community engagement support	Microgrid customer and host of emergency shelter

Source: Smart Electric Power Alliance, 2021

Table 2.2 - ***Key Stakeholders and Responsibilities***

Key Stakeholders	**Responsibility**	**Role**
Dane County Airport	Strategic support	Recipient of emergency services for airport travelers
Dane Buy Local	Strategic support	Local economic development organization
Holy Wisdom Board of Directors and Sustainability Team	Strategic support	Microgrid customer and host of emergency shelter
Benedictine Women	Strategic support	Community members
Town of Westport	Strategic support	Town covered by emergency shelter

Source: Smart Electric Power Alliance, 2021

Project Resilience Objectives and Metrics

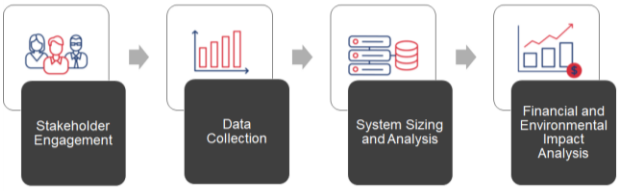
Extreme weather events threaten damage to the electrical system and disruption of power supply. These weather events are increasing both in frequency and economic impact in Wisconsin, causing prolonged outages, and disproportionately impacting underserved communities. This project presents the opportunity to collaborate with the community, propose and evaluate a solution to insulate critical services from the impacts of prolonged outages, and ultimately build community resilience. The study will identify a microgrid as a resiliency solution, develop microgrid designs that incorporate varying power supply technologies, and utilize stakeholder input to evaluate the feasibility of each microgrid design.

The feasibility study methodology included the following primary tasks completed by the project team:

1. **Stakeholder Engagement:** The project team will convene a group of key industry and community stakeholders to discuss the feasibility of a microgrid project at the Holy Wisdom Monastery Emergency Shelter.

2. **Data Collection:** The project team will collect community, utility, and energy consumption data relevant to the system sizing and financial and environmental impact analysis of a potential microgrid at the emergency shelter.
3. **System Sizing and Analysis**: The project team will evaluate up to four (4) preliminary microgrid scenarios. Based on stakeholder feedback, the project team will conduct a detailed system design of one of the modeled scenarios. The sizing and analysis will consider community function as the primary resilience objective and metric. Providing power to the emergency shelter to provide critical services when the grid is down is of utmost importance for the microgrid design and study.
4. **Financial and Environmental Impact Analysis**: The project team will conduct a benefit-cost analysis of one of the modeled scenarios to determine economic feasibility.

*Figure 2.1 - **Feasibility Study Methodology***



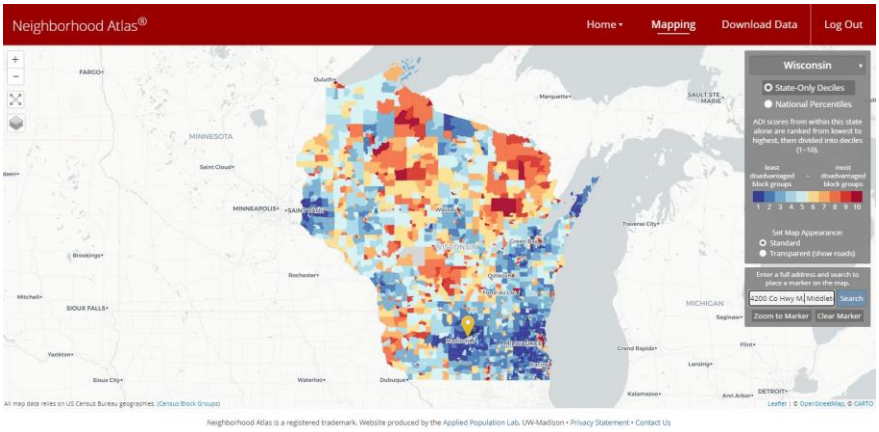
Source: Smart Electric Power Alliance, 2021

Evaluation of Site-Specific Information

The Holy Wisdom site has a 125 kilowatt (kW) customer owned solar PV system and a 550 kW utility owned diesel back-up generator. The diesel generator provides the customer back-up services as well as utility system support when necessary. This proposed microgrid study would evaluate the feasibility of retrofitting the existing resources with additional solar PV, battery energy storage, and natural gas standby back-up generation, along with microgrid controller functionality to allow for sustained islanding capabilities during a grid outage. The facilities are a geothermal system, and hence uses only minimal amount of natural gas. The retreat and guest house is considering replacing the outdated HVAC system with heat pumps, possibly in the near term.

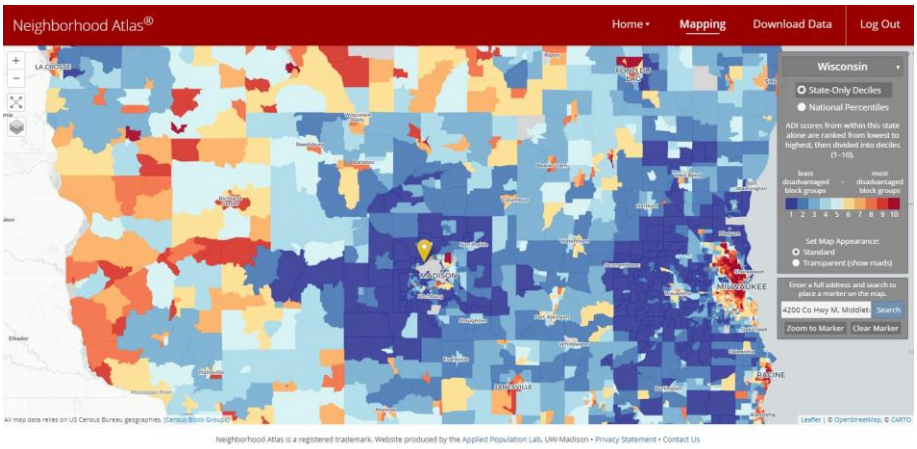
Figure 2.2 and 2.3 below show census block groups in Wisconsin categorized by their Area Deprivation Index score. The yellow marker on the map indicates the location of the site. The site is near some of the more disadvantaged census block groups in the state.

Figure 2.2 - ***State View: Area Deprivation Index by Census Block Group***



Source: University of Wisconsin-Madison, Neighborhood Atlas Map (2021)

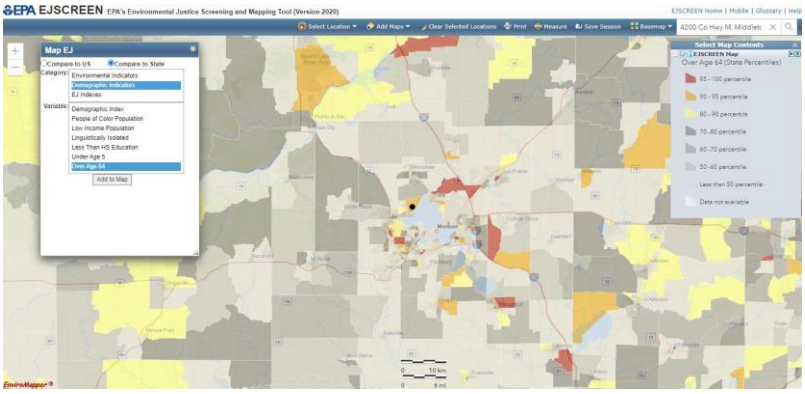
Figure 2.3 - ***Local View: Area Deprivation Index by Census Block Group***



Source: University of Wisconsin-Madison, Neighborhood Atlas Map (2021)

The EPA's Environmental Justice Screening and Mapping tool, highlighted in Figure 2.4 below, shows that the site is located in an area where the percent of the population that is over the age of 64 is in the 90-95th percentile of the state, making this an intriguing site for equitable resilience benefits.

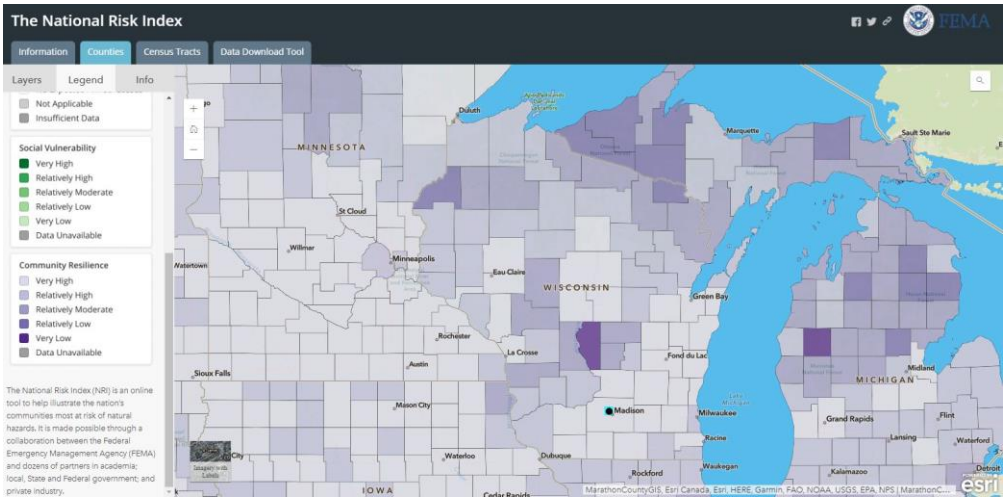
Figure 2.4 - ***Percentile of Population over 64 by Census Block***



Source: Environmental Protection Agency, EJSCREEN (2020)

Figures 2.5 indicates that the emergency shelter site is located in an area that has relatively low to relatively moderate community resilience risk.

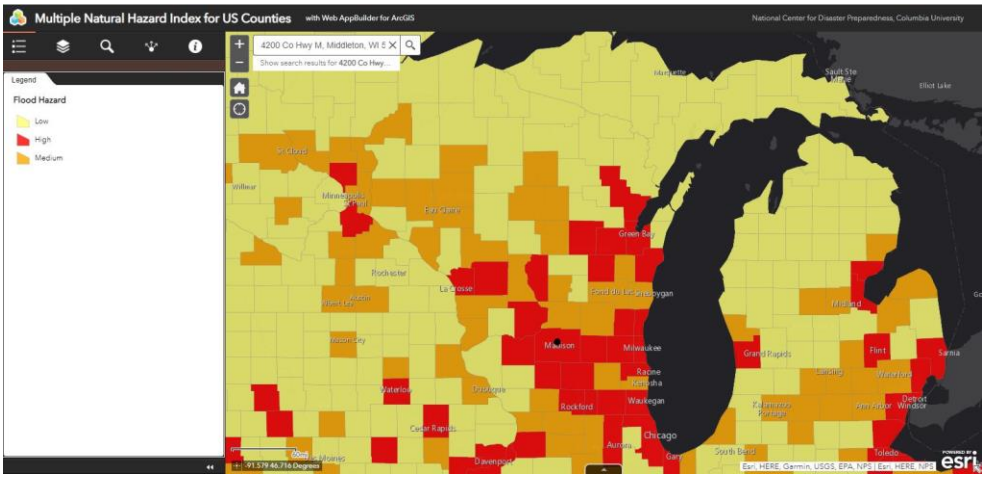
Figure 2.5 - ***Level of Community Resilience by County***



Source: FEMA, The National Risk Index (2021)

Figures 2.6 indicates that the site is located in an area that has a high flood hazard index according to the National Center for Disaster Preparedness. A more detailed evaluation of the flood risk near the site is illustrated in Figure 2.8, sourced from FEMA's National Flood Hazard Layer Viewer.

Figure 2.6 - ***Flood Hazards Near Proposed Site***



Source: GeoData@Wisconsin (2018)

Figure 2.7 - ***Flood Hazards Near Proposed Site***

Source: FEMA, National Flood Hazard Layer Viewer (2021)

Technologies Under Consideration

The existing site includes solar PV and a diesel generator. The proposed microgrid study for the emergency shelter will consider a combination of solar PV, battery energy storage, and natural gas and diesel generation technologies, as well as microgrid controller technologies. Given the site's existing natural gas feed-in, including the consideration of natural gas will allow for scenarios of longer duration that are more cost effective. The site will be assessed for solar potential to see what, if any, additional solar PV can be installed on-site in addition to the existing plans. Battery energy storage will be assessed to smooth the solar generation and allow for charging to occur for resilience benefits and energy cost savings.

This microgrid study will evaluate different technologies to provide resilience benefits at the site, including but not limited to solar PV, battery energy storage, natural gas and diesel generation, and microgrid capabilities.

Cost Match

The grant request is for a total of $50,000, with a cost share of $34,500 bringing the project total to $84,500. The cost share includes in-kind labor contributions by the local distribution utility, microgrid end-use customer, and the wholesale electricity supplier. This also includes in-kind scope contributions by SEPA for industry outreach. The applicant requests the award amount of $50,000 to fund the tasks necessary to complete a microgrid feasibility study. The project team labor contribution will allow for the necessary project coordination to develop a comprehensive microgrid feasibility study that includes stakeholder engagement, data collection, system sizing analysis, and financial and environmental impact analysis. MGE is currently investigating potential sites to install a storage solution that would provide both customer and utility system benefits. The Holy Wisdom site presents itself as a potential site that could both provide utility system benefits as a storage pilot, as well as individual customer and neighboring community benefits as an emergency shelter. This site is one of many sites being looked into at this time independently of this grant opportunity.

*Table 2.3 - **Summary of Project Costs***

PSC Grant Request ($):	Applicant Cost Share ($):	Project Total ($):
$50,000	$24,500	$74,500

Source: Smart Electric Power Alliance, 2021

*Table 2.4 - **Cost Share Breakdown***

Project Team	Cost Share	Explanation
SEPA (applicant)	$12,000	Lead stakeholder engagement, data collection, system sizing analysis, financial and environmental impact analysis, industry outreach
MGE	75 hours of in-kind labor ($7,500 value)	Participating in regular stakeholder meetings, supporting data collection and site assessment, system

		sizing and analysis, financial and environmental impact analysis
Holy Wisdom	50 hours of in-kind labor ($5,000 value)	Participating in regular stakeholder meetings, supporting data collection and site assessment, supporting financial analysis.

Source: Smart Electric Power Alliance, 2021

Data Collection Plan

The project team will convene regular stakeholder meetings to collect data and input relevant to the microgrid study. MGE has already shared energy demand and consumption data with the project team that will be utilized to complete the study. The project team will also have access to all mechanical and electrical drawings for the site and will be able to utilize them to support the microgrid study (see various site plans and maps included as reference). SEPA will utilize GIS capabilities to collect and analyze data from EIA, DHS, and FEMA to conduct analysis on the site's vulnerabilities and criticality to serve a public good during an outage event.

Additional data collection efforts are included in the sections below on system sizing analysis and financial analysis.

Systems Sizing Analysis

In the event of a power outage, the site is intended to serve as an emergency shelter to provide critical services to be included in a microgrid study but not limited to: food, shelter, heat and electricity. Other critical loads would include what is required to operate the site as an emergency shelter, which may include commercial kitchen and refrigeration, lights for safety, and outlets for device charging and communication.

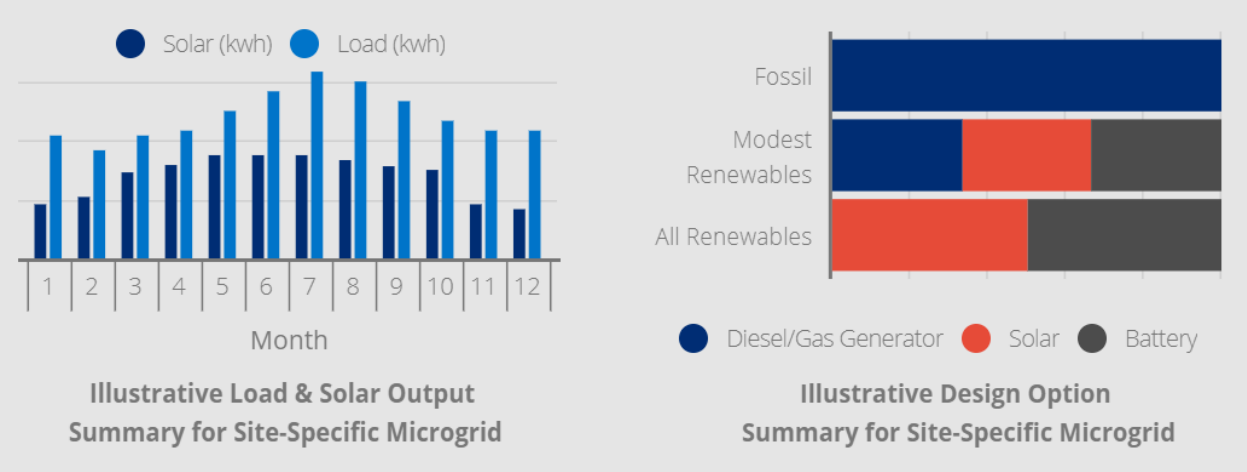
In normal grid connected operations, the storage assets may be utilized by the utility as needed. The microgrid design scenario modeling will include system sizing analysis for these applications that will include different microgrid packages, which will look at different load serving, generating technologies, storage, fossil fuel back-up, grid services, and islanding capabilities to determine the cost-effectiveness of different scenarios.

The estimated demand for the site is 100kW with an annual electrical usage of 498MWh. This includes 2020 data from both solar energy generated used behind the meter and the energy imported from MGE.

Careful consideration is needed when sizing microgrids as every situation offers unique challenges. Host load factor and shape along with cost concerns and environmental issues can lead to a broad range of microgrid sizes and costs. Setting these goals upfront will help tailor the microgrid as desired. Alternatively multiple scenarios can be studied that will help guide the decision process.

The system sizing and analysis efforts will include siting considerations such as utility interconnection and microgrid operating modes during normal and emergency operation. During emergency operation, the microgrid will be evaluated to serve critical functions at the site.

Figure 2.8 - ***Annual Overview of Load and Solar Output & Summary of Design Options***



Source: Smart Electric Power Alliance, 2021

As part of the stakeholder meetings, the project team will work with key stakeholders to identify the critical loads and desired resilience needs of the site. Then, the project team will work to appropriately size the microgrid to provide both grid and customer services in both grid-connected and islanded modes. Data gathered for this microgrid study will help the project participants and key stakeholders estimate cost and design options for a potential microgrid for the site.

Financial Analysis

The project team will conduct financial analysis that builds on the technical analysis, and focuses on developing a high-level inventory of potential costs and benefits for the microgrid project to assess the net benefit.

Holy Wisdom will support the financial feasibility analysis. Considerations in this analysis include:

- The use of third-party investors which utilize federal tax credits and depreciations
- The owner ownership of the on-site solar PV and BESS systems
- The interplay with MGE rate structures and the ability to use the BESS to provide grid services

When making investments in microgrid projects, it is important to evaluate the costs of the projects compared with the expected benefits. The goal of the financial analysis conducted in this study will be to quantify utility and societal benefits in economic terms, and determine how these economic benefits compare to the costs of implementing, operating, and maintaining the project over its lifespan. In order to do so, the local electric distribution utility will provide the necessary inputs for the project team to calculate potential ancillary service values, value of reliability and resiliency, wholesale benefits, and energy savings. These inputs part of the data collection plan may include inputs on frequency support and black start, reliability statistics on SAIDI, SAIFI and CAIDI, applicable customer energy and demand rates, available demand response programs, and energy usage data. MGE and Holy Wisdom provided the following SAIDI and SAIFI statistics that will be utilized to determine the value of reliability:

- SAIDI – 27.3 minutes
- SAIFI – 0.24

Holy Wisdom is served under the CG-4 rate at MGE. The customer charge is around $6 per month. The energy charge is around $0.01 per kilowatt-hour (kWh) for distribution service and $0.04 per kWh for base energy with $0.05 to $0.06 per kWh on-peak energy adders throughout the day. The On Demand Response Program (ODS) is also an available demand response program for the customer to participate in to receive additional financial benefit of a microgrid project. Other solar and renewable energy offerings that are available from MGE for the customer to participate in are: Shared Solar, Green Power Tomorrow, and Renewable Energy Rider (RER).

The benefits and costs will be quantified economically, and the multi-year cash flow will be translated into a Net Present Value (NPV). A benefit/cost ratio will be computed based on the NPV of all benefits divided by the NPV of all costs. A summary of potential costs and benefits are as follows:

- **Costs**: Generation (PV / NG), Battery Energy Storage System and Replacement, Microgrid Controller and Communications, Distribution Upgrades, Operations and Maintenance
- **Benefits**[1]: Solar Generation, Congestion Relief, Avoided Capacity Costs, Avoided Transmission Costs, Avoided REC Compliance Costs, Emissions Reductions, Value of Resiliency, Energy Savings, Peak Load Support.

Financing options that will be explored as part of the study may include a combination of investments made by Holy Wisdom and MGE, along with leveraging funding sources from FEMA and other government agencies to construct and install the microgrid.

[1] MGE does not have defined dollar values for the system benefits. For the study analysis, a value of $94k per MW of storage will be used for avoided capacity costs.

Environmental Impact

Holy WIsdom and MGE would like to reduce their overall impact on the environment and sees this feasibility study as a way to reduce greenhouse gas emissions and consumption of fossil fuels.

The renewable goal of the Holy Wisdom Monastery campus, already LEED Platinum Certified, is to achieve net-zero energy and carbon with on-site solar generation. To achieve net zero energy and carbon, the feasibility study will include analysis of the additional solar required, appropriate BESS size, and the microgrid configuration to support the two main buildings as the emergency shelter.

MGE has a goal to reduce carbon emissions by 20% by 2030 and a net-zero carbon electricity goal by 2050. The microgrid would incorporate solar PV to offset electric usage from the grid to reduce the environmental impact of electricity usage. The project team will calculate greenhouse gas emissions reductions associated with the project and the reductions will be utilized to compute the societal benefits from the emissions reductions.

3.0 Reference Materials List

- Holy Wisdom Meter Energy and Usage Data (attached separately)
- Holy Wisdom Letter of Support (attached separately)
- MGE Letter of Support (attached separately)
- Statewide Parcel Map Initiative Parcel Data (included in Narrative)
- GeoData@Wisconsin Aerial Mosaic (included in Narrative)
- University of Wisconsin-Madison Neighborhood Atlas Map (included Narrative)
- Environmental Protection Agency EJSCREEN Tool (included Narrative)
- The National Risk Index from FEMA (included Narrative)
- Multiple Natural Hazard Index for US Counties from Columbia University's National Center for Disaster Preparedness (included in Narrative)
- National Flood Hazard Layer Viewer from FEMA (included in Narrative)

Town of Westport

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www.townofwestport.org

August 3, 2021

Jared Leader
Senior Manager
Research and Industry Strategy at SEPA

RE: Holy Wisdom Monastery Microgrid Study

The Town of Westport is pleased to provide this letter to support the Holy Wisdom Monastery Microgrid Study.

The project application will support a stakeholder engaged process for evaluating and conducting a microgrid feasibility study. The team will study and identify potential deployment strategies for solar photovoltaics (PV), energy storage, and other microgrid technologies to bolster resilience at Holy Wisdom Monastery. Holy Wisdom Monastary is also an emergency shelter for the Town of Westport. The study will also model and analyze load profiles, microgrid designs, and project cost/benefits.

The Town of Westport understands the value of this project and looks forward to contributing as a strategic and technical partner of the applicant.

Thank you.

Very truly yours,

Thomas G. Wilson
Attorney/Administrator/Clerk-Treasurer

TGW/jd

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0803210827

Madison Gas and Electric Company
P.O. Box 1231
Madison, WI 53701-1231
608-252-7000
your community energy company

July 28, 2021

Sent Via Email
jleader@sepapower.org

Mr. Jared Leader
Senior Manager, Research and Industry Strategy
Smart Electric Power Alliance

Dear Mr. Leader:

Madison Gas and Electric Company (MGE) is pleased to provide this letter to support the Town of Westport St. Benedicts Center Emergency Shelter microgrid study.

The project application will support a stakeholder-engaged process for evaluating and conducting a microgrid feasibility study. The team will study and identify potential deployment strategies for solar photovoltaics (PV), energy storage, and other microgrid technologies to bolster resilience at the St. Benedicts Center Emergency Shelter against power outages. The study will also model and analyze load profiles, microgrid designs, and project costs/benefits.

MGE understands the value of this project and looks forward to contributing as a strategic and technical partner of the applicant. Please contact me with questions or concerns at (715) 323-1686 or alindgren@mge.com.

Sincerely,

Aaron Lindgren

Aaron L. Lindgren
Engineer IV Energy Products and Services

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